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Comparative Fertility Studies of Bovine Semen Diluents Containing Powdered Skim Milk, Fresh Skim Milk, Glycine, and Egg Yolk

BY

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SUMMARY.—1. *In a split sample field trial involving* 10,189 *first inseminations from* 17 *bulls the conception rate of* 68.4 *per cent., obtained with a* 9 *per cent. skim milk powder diluent, was significantly greater than that of* 63.5 *per cent., obtained with the egg-yolk citrate diluent. The increased conception rate was confined to* 6 *bulls, which had the lowest fertility in the egg-yolk citrate diluent. Two of these bulls were subsequently shown to be infected with* V. fetus. *Since both diluents contained streptomycin the latter would appear to be more effective in the milk than in the egg-yolk citrate diluent.*

2. *No overall beneficial effect resulted from increasing the level of the streptomycin calcium chloride in the* 9 *per cent. skim milk powder diluent from* 500 *to* 1,000 *μg. per ml. of diluent.*

3. *When a skim milk powder diluent was used without antibiotic it gave a lower conception rate than that obtained with the same diluent containing* 1,000 *μg. per ml. of streptomycin calcium chloride. Of the* 17 *bulls used in this trial one showed a significantly increased conception rate and two showed fertility increases bordering on the level of significance when used with the streptomycin diluent. All these bulls were free from* V. fetus.

4. *The addition of glycine or egg yolk to the* 9 *per cent. skim milk powder diluent did not improve the overall conception rate, but, since these additions appeared to maintain a constant level of fertility over two days of use, these diluents could probably be usefully investigated further.*

5. *No differences in conception rates were obtained when fresh and powdered skim milk diluents were compared.*

6. *On* in vitro *tests diluents prepared without previous heat treatment from* 8 *samples of skim milk powder supported normal spermatozoan survival, whilst diluents prepared from three other powders were rapidly toxic for spermatozoa. With diluents, prepared from skim milk powders showing these different* in vitro *effects on spermatozoan survival, no differences in conception rates were obtained in a controlled field trial, when these diluents were heated at* 92° *C. for* 10 *minutes.*

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THE report of Michajelov (1950), that heated milk would support survival of bovine spermatozoa at 5° C., stimulated many workers to investigate the use of milk as a semen diluent in routine artificial insemination; this work has been reviewed by Thacker and Almquist (1953) and Salisbury (1957). Conception rates comparable with those obtained by the use of egg-yolk citrate buffer have been reported by Thacker *et al.* (1953), Flerchinger, Erb, and Ehlers (1953), Almquist, Flipse, and Thacker (1954), and Williams, Green, and Baltzer (1954), who used heated homogenised whole milk and by Almquist *et al.* (1954), Adler and Rasbech (1956), and Kerruish (1956) who used heated skim milk; Bolton and Durrell (1954), however, reported a lower conception rate following the use of skim milk. Certain workers, Dreher and Webb (1953), Almquist (1954), and Perkins, Carpenter, and Seath (1955), found that those bulls giving the lowest conception rates with yolk citrate diluent showed an

increased fertility rate in milk diluent. Attention has also been drawn to the use of skim milk powder by Marion and Olsen (1952), Collins (1953), and Melrose (1956), who gave a preliminary report on certain of the investigations reported below.

The *in vitro* effects of milk on bovine spermatozoa have also been extensively studied. Unheated, whole or skim milk, and also certain skim milk powders quickly rendered bovine spermatozoa immotile. This toxic factor has been investigated by Thacker, Flipse, and Almquist (1954), and Flipse, Patton, and Almquist (1954), who showed that the factor was probably lactenin, an anti-streptococcal substance normally present in the albumen fraction of milk, and that it could be reliably inactivated by controlled heating. Boyd, Perkins, Olds, and Seath (1954), and Johnson, Flipse, and Almquist (1955) demonstrated that the addition of sulph-hydryl compounds to the unheated milk diluent also resulted in normal *in vitro* survival of the spermatozoa. More recently, Saacke, Almquist, and Flipse (1956) have confirmed the postulation of Johnson *et al.* (1955) that the heat treatment of fresh milk released sulph-hydryl groups, possibly from the denatured β-lactoglobulin fraction, and these groups in turn inactivated the toxic factor; in addition the heating itself would appear to have a direct destructive effect on this toxic factor.

Since sulph-hydryl containing compounds such as cysteine hydrochloride or thio-glycollic acid could inactivate the lactenin, the addition of these to the milk diluent have been shown to obviate the need for heat treatment of milk diluents.

Although fresh homogenised whole milk and also fresh skim milk could therefore be used with confidence as a semen diluent after heat treatment, it was considered desirable to investigate further the use of powdered skim milk since the latter offered certain advantages; it could be kept readily available for reconstituting and therefore for preparation of the diluent; such a product would also ensure that a diluent of constant composition could be made available for use over a given period—an important consideration in carrying out a series of controlled field fertility trials. The following series of fertility trials using powdered skim milk as a basis for a semen diluent were therefore carried out on a split sample basis:—

Trial 1. A comparison of yolk/citrate and reconstituted skim milk diluents and an investigation into the reported increased conception rates with certain bulls.

Trials 2 and 3. The effect of the addition of streptomycin to the reconstituted skim milk diluent.

Trial 4. The effect of addition of (i) egg yolk and (ii) glycine to reconstituted skim milk.

Trials 5 and 6. The effect on fertility of different skim milk powders and also a comparison of these with fresh skim milk.

Materials and Methods

Semen collections were made 3 times weekly using the usual short-pattern artificial vagina, each bull being used, on an average, once every 7 days. The motility of the undiluted semen was assessed by microscopic examination at 37° C. immediately after collection. Suitable samples were diluted 1:50 on a split sample basis in equal volumes of the 2 diluents, which were brought to 20° C. before the addition of the semen. Immediately after dilution, the semen was transferred to tubes of 15 to 20 ml. capacity and stored at 5° C. for use either at a sub-centre or at the main centre. The distribution of the diluted semen was arranged so that each sub-centre or main centre received the semen from each bull diluted alternately in the control and trial diluent. Throughout the main and sub-centre areas, equal volumes of semen diluted in either of the 2 diluents were available for use on the day of collection and on the subsequent day. The conception rate, which was obtained for each day of use of the semen, was estimated as the percentage of cows or heifers not reported to have required a repeat insemination within a period of 16 weeks from the date of the first insemination.

The 9 per cent. wt./vol. solution of skim milk powder was freshly prepared for each collection day. The skim milk powders were reconstituted by mixing in a beaker with distilled water, previously boiled and allowed to cool to 45° C. Once reconstituted, the skim milk was transferred to a conical flask and (except where otherwise indicated) heated in a water bath to 92° C. and held at that temperature for 10 minutes; thereafter it was cooled to room temperature, the volume adjusted to correct for any loss through evaporation and, after addition of streptomycin, it was stored at 5° C. until required, when its temperature was raised to 20° C. All diluents contained 500 μg. streptomycin calcium chloride per ml. of diluent except where otherwise stated. Every precaution was taken to avoid contamination of the different samples of skim milk powder which had all been manufactured by the high-temperature, spray-drying process. Also glassware used for unheated milk was carefully washed and sterilised to avoid it coming in contact with heated milk.

The liquid skim milk was obtained immediately after skimming and a fresh supply was heat treated for each collection day. The fat content of this was 0.02 per cent.

The egg-yolk citrate diluent consisted of equal volumes of egg yolk and a 3.6 per cent. solution of Analar sodium citrate ($Na_3C_6H_5O_7 2H_2O$) in distilled water.

For laboratory storage tests 5 ml. volumes of semen diluted 1:50 were stored at 5° C. and motility estimations made microscopically at 37° C. up to 10 days after collection. Only spermatozoa showing progressive movement were included in these motility ratings.

Results

Trial 1. Comparison of Yolk/Citrate and powdered skim milk diluents

A 9 per cent. solution of skim milk powder was compared with the usual egg-yolk citrate diluent (both diluents containing 500 μg. streptomycin per ml.) on a field fertility trial with the following results:—

TABLE I

Day of use	Yolk/Citrate: First inseminations	Yolk/Citrate: Conception rates per cent.	Skim milk powder: First inseminations	Skim milk powder: Conception rates per cent.	X^2 Test P =
1st	2,678	65·3	2,676	68·9	0·01 –0·001
2nd	2,435	61·4	2,400	67·8	<0·001
Total	5,113	63·5	5,076	68·4	<0·001

TABLE II

Bull	Yolk/Citrate: First inseminations	Yolk/Citrate: Conception rates per cent.	Skim milk powder: First inseminations	Skim milk powder: Conception rates per cent.	X^2 Test P =
S15	196	70·9	167	67·1	>0·1
H4	410	70·0	345	76·5	0·05
J32	311	68·8	326	70·6	>0·1
F9	224	68·8	258	69·0	>0·1
A13	340	67·9	345	66·4	>0·1
H6	434	67·1	448	67·6	>0·1
S14	211	65·9	220	65·0	>0·1
G14	299	65·6	296	67·2	>0·1
F13	137	64·2	111	67·6	>0·1
G17	272	63·2	252	69·4	>0·1
S2	314	62·1	338	69·8	0·05 –0·02
F12	392	59·9	363	71·1	0·01 –0·001
G15	410	59·5	396	70·7	<0·001
A15	288	59·0	339	67·6	0·05 –0·02
J23	302	57·6	283	58·8	>0·1
F10	230	56·1	203	70·4	0·01 –0·001
F2	343	54·5	386	65·3	0·01 –0·001
Total	5,113	63·5	5,076	68·4	<0·001

Table I shows that a significantly increased conception rate ($P<0.001$) was obtained with the milk diluent both in the overall results and also on each day of use. Although there was a significant drop ($P=0.01-0.001$) in conception rate with the yolk citrate from first to second day of use, there was no loss in fertility with the semen stored over the same period in the case of the milk diluent. A study of the individual bull results given in Table II showed that 6 of the 17 bulls showed a significantly increased conception rate in the milk diluent and these six bulls were among the seven showing the lowest fertility in the yolk citrate diluent. Bull H4, with a relatively high conception rate in the yolk citrate diluent, showed a conception rate increase bordering on the level of significance ($P=0.05$) in the milk diluent.

Trial 2. Comparison of two levels of streptomycin in the powdered skim milk diluent

This trial was carried out to compare the effect of addition of either 500 μg. or 1,000 μg. streptomycin to each ml. of the 9 per cent. skim milk powder as used above. The results given in Table III showed that no beneficial effect on conception rate resulted from the use of the higher concentration of the antibiotic; also with the exception of bull F2 no significant effect on fertility was observed in any of the individual bull results (see Table IV).

TABLE III

Day of use	Skim milk powder with 500 μg streptomycin per ml.: First inseminations	Skim milk powder with 500 μg streptomycin per ml.: Conception rates per cent.	Skim milk powder with 1,000 μg streptomycin per ml.: First inseminations	Skim milk powder with 1,000 μg streptomycin per ml.: Conception rates per cent.
1st	1,781	66·2	1,722	67·5
2nd	1,724	64·1	1,731	65·2
Total	3,505	65·2	3,453	66·3

TABLE IV

Bull	Skim milk powder with 500 μg streptomycin per ml: First inseminations	Skim milk powder with 500 μg streptomycin per ml: Conception rates per cent.	Skim milk powder with 1,000 μg streptomycin per ml.: First inseminations	Skim milk powder with 1,000 μg streptomycin per ml.: Conception rates per cent.
S2	187	59·3	161	65·2
S14	212	62·3	181	69·1
S15	181	67·9	167	70·6
G14	263	66·1	305	64·6
G15	238	54·6	282	59·9
G17	258	69·0	232	62·1
*F2	178	59·5	183	72·1
F9	147	70·1	137	73·7
F10	74	68·9	76	57·9
F12	25	48·0	33	60·6
F13	195	66·1	199	64·8
H4	353	70·0	299	70·6
H6	309	74·1	356	67·4
J23	258	62·0	235	67·2
J22	242	64·9	264	68·6
A13	195	64·1	157	61·1
A15	190	62·6	186	65·0
Total	3,505	65·2	3,453	66·3

*The difference in conception rate of bull F2 was significant ($P = 0.02 - 0.01$).
All other differences were not significant.

Trial 3. The conception rate obtained in skim milk diluent with and without the addition of streptomycin

Two of the 6 bulls that showed an increased conception rate in Trial 1 were found to be infected with *Vibrio fetus*. Following the elimination of this infection from the bull stud by test mating and subsequent treatment of bulls found to be infected, as reported by Morgan, Melrose, and Stewart (1958) it appeared necessary to ascertain whether an increased conception rate following the antibiotic addition could still be demonstrated in the milk diluent. The 9 per cent. skim milk powder diluent was therefore used either without antibiotic or with the addition of 1,000 μg. streptomycin per ml. on the usual split sample basis. The results (see Table V) showed that there was a significant increase in

TABLE V

Day of use	Skim milk powder without streptomycin		Skim milk powder with 1,000 μg streptomycin per ml.		X^2 Test P =
	First insemination	Conception rate per cent.	First insemination	Conception rate per cent.	
1st	2,767	63·4	2,718	66·7	0·02 –0·01
2nd	2,619	58·3	2,488	61·8	0·02 –0·01
	5,386	60·9	5,206	64·3	<0·001

TABLE VI

Bull	Skim milk powder without streptomycin		Skim milk powder with 1,000 μg streptomycin per ml.		X^2 Test P =
	First insemination	Conception rate per cent.	First insemination	Conception rate per cent.	
S16	282	62·1	277	65·3	>0·1
S15	306	56·9	345	63·8	0·1 –0·05
S14	345	65·5	333	66·7	>0·1
G9	374	54·8	346	61·6	0·1 –0·05
G15	404	57·2	427	63·0	>0·1
G13	420	64·0	397	63·7	>0·1
F12	773	58·7	686	65·6	0·01 –0·001
F13	663	64·9	584	64·2	>0·1
F2	746	60·9	736	62·6	>0·1
H6	409	68·9	415	70·6	>0·1
H5	447	59·7	462	64·3	>0·1
J23	217	52·1	198	58·1	>0·1
Total	5,386	60·9	5,206	64·3	<0·001

both the overall conception rates and on each day of use with the diluent containing streptomycin. The individual bull results given in Table VI, however, showed that only one bull, F12, had a significantly higher conception rate (P=0.01—0.001) with the streptomycin addition, but two other bulls, S15 and G9, showed increases in conception rates bordering on the level of significance (P=0.1—0.05). It should also be noted that bull F2, which had shown a significantly increased conception rate in Trials 1 and 2, showed no increased fertility with the addition of the antibiotic after it had been successfully treated for *V. fetus*. It must also be noted that, in this trial, there was a significant drop in conception rate from 1st to 2nd day of use with this milk diluent.

Trial 4. The effect on fertility of addition of egg yolk and glycine to skim milk diluent

Investigations were initiated with the object of obtaining a diluent which would ensure a satisfactory fertility with semen stored for longer periods than was at present possible. Following the drop in conception rate from 1st to 2nd day, as reported above, *in vitro* tests were carried out to study the effect on sperm survival of the addition to the above skim milk diluent of egg yolk and glycine. Both these additions appeared to increase sperm survival and their effect on fertility was therefore investigated as follows:—

(a) *Addition of egg yolk*

A diluent, prepared by adding 12.5 ml. egg yolk to 87.5 ml. of a 10.3 per cent. (wt./vol.) skim milk powder solution in distilled water (to give a final concentration of 12.5 per cent. egg yolk and 9 per cent. skim milk powder) was compared with the usual 9 per cent. skim milk powder diluent. The conception rates obtained (see Table VII) were similar with both diluents; although the overall difference was not significant, the drop from 1st to 2nd day was lowest with the milk/yolk diluent.

TABLE VII

Day of use	Skim milk powder		Skim milk powder and egg yolk	
	First inseminations	Conception rate per cent.	First inseminations	Conception rate per cent.
1st	1,107	67·2	1,130	68·7
2nd	1,169	64·3	1,209	67·6
Totals	2,276	65·7	2,339	68·1

(b) *Addition of glycine*

A diluent consisting of equal volumes of a 3 per cent. glycine solution in distilled water and a 9 per cent. skim milk powder solution in distilled water was compared with the standard 9 per cent. skim milk powder solution. The results given in Table VIII are comparable with those reported above for the addition of yolk. No overall increase in conception rate was obtained; there was a decrease in conception rate from first to second day of use with the 9 per cent. milk diluent, but this did not occur with the milk/glycine and milk/yolk diluents.

TABLE VIII

Day of use	Skim milk powder		Skim milk powder and glycine	
	First inseminations	Conception rate per cent.	First inseminations	Conception rate per cent.
1st	773	68·8	720	67·4
2nd	748	63·8	704	67·0
Totals	1,521	66·3	1,424	67·2

Trial 5. Comparison of fresh and powdered skim milk diluents

Since many workers had reported satisfactory results using fresh skim milk, diluents prepared from this and from skim milk powder were compared. Since both diluents were heated at 92° C. for 10 minutes the fresh skim milk was therefore subjected to a single heat treatment whereas the skim milk powder had actually been twice heated (*viz.* firstly in the manufacturing process and again in the

laboratory after being reconstituted). It was, therefore, important to determine if this additional heat treatment lowered the usefulness of the dried skim milk as a semen diluent compared with the fresh product. The results in Table IX showed that there was no difference in the overall conception rates and also the difference between 1st- and 2nd-day results with the powdered milk were similar to those obtained with fresh skim milk diluent.

TABLE IX

Day of use	Fresh skim milk		Skim milk powder	
	First inseminations	Conception rate per cent.	First inseminations	Conception rate per cent.
1st	983	70·1	993	68·7
2nd	966	67·8	1,032	66·1
Total	1,949	68·9	2,025	67·3

Trial 6. Investigations into possible variations in the dried skim milk powder

The difference between 1st- and 2nd-day conception rates obtained in the above trials, although not always statistically significant, prompted a study of the effects of different samples of skim milk powder on spermatozoan survival. An examination of 11 samples of skim milk powder, spray dried by the high temperature process, revealed that diluents prepared from all samples supported spermatozoan survival when these diluents had been previously heated. However, without this heat treatment, with the diluents prepared from 8 of the powders, normal spermatozoan survival occurred, but, with the diluents prepared from the other 3 powders, 95 to 100 per cent. of the spermatozoa were immotile after 24 hours' storage at 5° C. This detrimental effect on spermatozoan survival was also noticeable after storage for 6 to 8 hours at 5° C.

Since these results suggested a possible variation in the degree of heat treatment to which the powders had been subjected in the manufacturing process, it was of obvious importance to ascertain if this variation could affect the fertility of semen diluted in diluents prepared from these different powders.

A diluent prepared from a powder (ND-5) which showed the above *in vitro* toxic effect when used without heat treatment was compared with a diluent prepared from another powder (187) which supported normal spermatozoan survival at 5° C. Both diluents were heated at 92° C. when used for this fertility trial and, as shown in Table X, no differences in conception rates were obtained.

Table X

Day of use	Powder ND 5		Powder 187	
	First inseminations	Conception rate per cent.	First inseminations	Conception rate per cent.
1st	782	66·4	851	65·3
2nd	798	60·4	777	60·7
Totals	1,580	63·4	1,628	63·1

The possibility of variations between samples from the same manufacturer's batch but showing the same *in vitro* effect was investigated. Once again (see Table XI) the conception rates were similar in both cases.

TABLE XI

Day of use	Powder 269		Powder 187	
	First inseminations	Conception rate per cent.	First inseminations	Conception rate per cent.
1st	1,143	66·0	1,171	66·6
2nd	1,116	62·9	1,079	62·2
Totals	2,259	64·4	2 250	64·5

These results showed that, in spite of the different *in vitro* effects when used unheated, no difference in conception rates was obtained when the diluents, prepared from these powders, were heated at 92° C. for 10 minutes. There was, however, a noticeable drop in conception rate with all four diluents from 1st to 2nd day of use.

Discussion

The finding of an increased conception rate with the milk diluent in Trial 1 with certain bulls, which had the lowest fertility in the egg-yolk citrate, is in accordance with the reports of Almquist (1954), Dreher *et al.* (1953), and Perkins *et al.* (1955). Since both diluents contained streptomycin the results suggested that the antibiotic was more effective in the milk than in the yolk citrate diluent. Simultaneously with the completion of Trial 1 an extensive test-mating programme for the diagnosis of *V. fetus* revealed that 2 of the 6 bulls showing a significantly increased conception rate in the milk diluent were infected with *V. fetus*; no reason can be given for the increased fertility in the case of the other four bulls which were repeatedly negative at test matings for *V. fetus*. The maintenance of a similar conception rate over 2 days of use with the milk diluent and the drop in fertility with the yolk citrate on the second day of use appeared to account for the overall increased conception rate with the milk diluent. Throughout this trial the conception rate was more constant with the milk than with the yolk-citrate diluent, which had been suspected of causing fluctuations in conception rates in previous years. Since no overall increased conception rate was obtained in Trial 2 the results did not confirm the suggestion of Almquist *et al.* (1954) that a higher concentration of antibiotic might have prevented the lowered conception rate reported by Bolton *et al.* (1954) when using a skim milk diluent. However, it must be pointed out that bull F2 which showed a significant increase in fertility with the higher level of streptomycin was also found to be infected with *V. fetus*. The result of Trial 3 showed that the addition of streptomycin to the milk diluent at a level of 1,000

μg. per ml. gave a significantly greater conception rate than that obtained with the same milk diluent without this antibiotic addition. No reason for this increase can be given, but all bulls used in the trial had been negative at repeated test matings for *V. fetus*. The results also showed that it would be advisable in A.I. practice to use antibiotics along with the milk diluent.

Although the addition of glycine and egg yolk to the milk did not improve the overall conception rate, the results suggested that the conception rates obtained with semen stored in these diluents for one or two days after collection might usefully be investigated further. Perkins *et al.* (1955), in comparing the fertility of semen diluted and stored in milk and egg-yolk citrate over 3 days, reported that, up to the second day of storage, milk gave a higher fertility than the yolk citrate, but on the third day of use these results were reversed. The *in vitro* tests confirmed that glycine increased sperm survival as had already been reported by Knoop and Krauss (1944) and Roy and Bishop (1954) who used glycine with yolk, and by Flipse and Almquist (1956) who also used glycine with milk.

Although *in vitro* tests showed that unheated diluents prepared from different milk powders tested would either support or destroy spermatozoan motility, no difference in fertility was obtained when diluents prepared from these different powders were heated at 92° C. for 10 minutes and subsequently used in a controlled fertility trial. These results suggested that, although the powders tested may have been subjected to different degrees of heat treatment in the manufacturing process, the *in vitro* test did not show any difference in fertility when the different skim milk powders were used as semen diluents after reconstitution and heat treatment. The difference between the first and second-day conception rates has, however, shown the need for further investigation into the possible effect of heat treatment on the milk used as a diluent. At present the use of a skim milk powder manufactured by a restricted pre-heating process is being investigated.

No fertility trials involving the inactivation of the toxic factor for spermatozoa in milk by the addition of cysteine hydrochloride as reported by Boyd *et al.* (1954) and Johnson *et al.* (1955), were carried out, since, in view of possible risks of an infectious disease spread, it was not considered advisable to use unheated milk as a semen diluent.

It must also be emphasised that the heat treatment of the diluents in these trials was carefully carried out in a water bath to ensure that the temperature remained at 92° C. and that the duration of heat treatment was not allowed to exceed 10 minutes. Also it is most essential that glassware, which has previously contained unheated milk, must not be subsequently used for heated milk unless such glassware has been carefully cleaned and sterilised. Laboratory tests showed that the addition of 0.6 ml. of unheated to 10 ml. of heated milk adversely affected spermatozoan survival.

Milk diluents appear to have a distinct advantage over the yolk citrate in that they are cheaper to prepare. The fact that the antibiotic appears to be more effective in the milk than in the yolk citrate could also be of great practical importance. By the use of a skim milk powder a diluent of a constant composition can be readily made available for use over a period; this is an important consideration in carrying out controlled field fertility trials over long periods. The need for using a powder obtained from a reliable source must also be emphasised; the harmful effects on spermatozoan survival of heated fortified skim milk products have been reported on by Almquist, Saacke, and Patton (1955).

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Examination of Urine for Some Abnormal Chemical Constituents

BY

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SUMMARY.—Demonstration of some abnormal chemical constituents of urine by routine and tablet tests was carried out on samples taken from a random 125 dogs of either sex. The results obtained by both methods are compared. Attention is drawn to the variance between the urinary findings and the clinical picture. It was shown that the proprietary tablet tests correspond closely to the accepted techniques.

Introduction

WHILE this work was originally intended to compare the results obtained using proprietary tablets for urine analysis and the accepted techniques, it was decided that as clinical notes had been kept, a useful comparison could be made between the clinical picture and urinary findings.

The article is therefore presented in two parts: (1) the comparison of the results using the different techniques; (2) the correlation of the clinical picture and the urinary findings. Urine samples were taken at random, some by collection and some by catheterisation. They were examined for the following constituents: (1) reducing substances; (2) diacetic acid; (3) protein; (4) bile pigments; (5) blood.

Methods

The tests used were:—

(1) *Reducing Substances*

(a) Benedict's method. Eight drops of urine and 5 c.c. Benedict's Solution were boiled together in a water-bath and allowed to cool. They were examined carefully 10 minutes after being removed from the water-bath and graded from + when the slightest colour change was visible, to ++++ when the Benedict's had apparently been totally reduced.

(b) Clinitest tablets. Using a standard pipette, 5 drops of urine and 10 of water were placed in a test-tube and a tablet added. Fifteen seconds after the reaction had ceased the tube was shaken and compared against the colour chart provided.

(2) *Diacetic Acid*

(a) Gerhardt's test. Using 10 per cent. ferric perchloride.

(b) Acetest tablets. One drop of urine was placed on a tablet and the colour developed within 30 seconds was compared against the colour chart provided.

(3) *Protein*

(a) The addition of 2 to 3 drops of 20 per cent. sulphosalicylic acid to 1 ml. urine.

(b) Altest tablets. To about 1 inch of urine in a test-tube was added one Altest tablet. After the reaction had finished the tube was shaken and the turbidity was estimated. If the urine was coloured green at the end of the reaction further tablets were added until the colour returned to yellow. This was done to prevent false negatives in acid urines.

(4) *Bile Pigments*

(a) The nitric acid ring test. On to 1 ml. of concentrated nitric acid in a test-tube was carefully layered 1 ml. of urine. The presence of a purple-green ring was taken to indicate the presence of bile pigments and these were classified from 1+ to 3+ according to the intensity of the colour.

(b) Ictotest tablets. Five drops of urine were placed on an absorbent mat, a tablet was placed on the mat, and 2 drops of water flowed onto the tablet. The speed of development and intensity of blue colour developing after 30 seconds was noted.

(5) *Blood Test*

(a) Benzidine reaction. A knife point of benzidine was dissolved in glacial acetic acid to which an equal volume of 10 vols. H_2O_2 was added. To this was added a small quantity of urine and the presence of blood was denoted by the development of a blue colour.

(b) Redceltest (Occultest) tablets. Five drops of urine were put onto filter paper, a tablet was placed on the wet area and flooded with 2 drops of water. The intensity of colour developing after 2 minutes was noted.

Results

Comparison of liquid and tablet tests. Results of 125 analyses.

(1) *Reducing substances.* 30 positive reactions.

(*a*) Benedict's	+	++	+++	++++	
(27)	13	10	2	2	
(*b*) Clinitest	Trace	¼%	½%	1%	2% or over
(30)	14	6	5	3	2

(2) *Diacetic Acid.*—5 positive results were obtained with both techn ques.

(*a*) Gerhardt's	+	++	+++	
	1	2	2	
(*b*) Acetest	Weak	Medium	Strong	
	2	1	2	

(3) *Protein.*—39 samples were positive.

	+	++	+++	++++
	14	12	10	3

Altest tablets were not available when the survey was carried out but the following results have been obtained since then.

(*a*) 20% Sulphosalicylic acid	+	++	+++	++++
(50)	18	13	14	5
(*b*) Altest tablets (50)	16	15	16	3

(4) *Bile pigments.*—49 positive results obtained with both techniques.

(*a*) Nitric acid ring test	+	++	+++
	40	7	2
(*b*) Ictotest	38	8	3

(5) *Blood.*—5 positive reactions were obtained with both techniques.

(*a*) Benzidine	+	++	+++
	–	2	3
(*b*) Redceltest (Occultest)	–	1	4

Correlation of urinary findings and clinical picture

(1) *Reducing substances.* Of the 30 positive results obtained only 2 were from diagnosed cases of diabetes mellitus.

(2) *Ketone bodies.* Of the 5 positive reactions to Gerhardt's test 2 were from cases of diabetes, the significance of ketonuria in the other 3 is uncertain.

(3) *Protein.* Of the 39 samples which were positive for protein, only 24 were from cases in which protein was to be expected. In the past some clinicians have accepted that proteinuria is common in old dogs; in our experience, however, it is not a regular finding. (See Tables I and II.)

TABLE I

DOGS SHOWING IDIOPATHIC PROTEINURIA
(15 cases)

Age	Sex	Breed	Diagnosis
5 years	Female	Boxer	Dermatitis.
8 ,,	,,	,,	Local injury to eye.
11 ,,	Male	Mongrel	Dermal neoplasia.
8 ,,	Female	,,	Dermatitis.
8 ,,	,,	,,	Osteitis
6 ,,	Male	Poodle	Luxated lens
1 ,,	,,	Peke	Pruritus
10 ,,	,,	Mongrel	Luxated lens
18 months	,,	Bulldog	Impacted anal glands
15 ,,	,,	Peke	Impacted anal glands
Aged	,,	Boxer	Arthritis
12 years	,,	Labrador	Obesity
3 ,,	,,	Bull terrier	? Pancreatic deficiency
10 ,,	,,	Peke	Pruritus
14 months	,,	Boxer	Staphylomata.

TABLE II

DOGS AGED 9 YEARS OR OVER SHOWING NO PROTEIN
(15 cases)

Age	Sex	Breed	Diagnosis
10 years	Female	Spaniel	Polydipsia of unknown origin
11 ,,	,,	Mongrel	Closed pyometritis
9 ,,	,,	,,	Diabetes
11	Male	,,	Alopecia
11 ,,	,,	,,	Senility
10 ,,	,,	,,	Luxated lens
9 ,,	,,	,,	Otitis
13 ,,	Female	Wire hair terrier	Emesis of unknown aetiology
10 ,,	,,	Mongrel	Gastro-enteritis
10 ,,	,,	,,	Dermatitis
9 ,,	Male	Collie	Enteritis
10 ,,	Female	Scottie	Anal neoplasm
9 ,,	Male	Mongrel	Interdigital cysts.
12 ,,	,,	,,	Senility
14 ,,	,,	,,	Superficial injuries due to car accident

(4) *Bile pigments.* Bile pigments were present in 49 of the 125 samples examined. The clinical findings of 23 of these only were consistent with bilirubinuria. (See Table III.)

(5) *Blood.* This was found in only two cases in which it was not expected and was possibly due to catheterisation.

TABLE III

DOGS SHOWING IDIOPATHIC BILIRUBINURIA
(26 cases)

Age	Sex	Breed	Diagnosis
10 years	Male	Scottie	Dermal neoplasia
2½ ,,	,,	Spaniel	Otitis
7 ,,	,,	,,	Otitis
11 ,,	Female	Scottie	Pneumonia
8 ,,	,,	Boxer	Eye injury
7 ,,	,,	Chow	Dermatitis
8 ,,	Male	Mongrel	Bronchitis
7 ,,	,,	,,	Myositis
10 ,,	,,	Alsatian	Anal furunculosis
7	,,	Dachshund	Dermatitis
12 ,,	,,	Mongrel	Dermal neoplasia
2	,,	West Highland Terrier	Oesophageal foreign body
4 ,,	,,	Corgi	Dermatitis
8 ,,	,,	Poodle	Intervertebral disc lesion
14 months	,,	Boxer	Staphyloma
15 ,,	,,	Peke	Dermatitis
4 years	,,	Cairn	Pruritus
1 ,,	,,	Dachshund	Dermatitis
9 ,,	,,	Mongrel	Otitis
11 ,,	,,	,,	Alopecia
8 ,,	,,	,,	Osteitis
18 months	,,	Peke	Dermatitis
6 years	,,	Poodle	Luxated lens
10 ,,	,,	Mongrel	Luxated lens
4 ,,	,,	Poodle	Myalgia
3 ,,	,,	Spaniel	Dermatitis

Discussion

The presence of small quantities of reducing substances is accounted for by the presence of glucuronides, detoxication products, lactose in the lactating and suckling animal, and glucose in samples taken shortly after a high carbohydrate meal and, in some cases, perhaps to a lowered renal threshold.

Ketonuria may occur in early morning samples as a result of overnight fasting and blood, where there is no evidence of urinary tract lesions, is probably the result of catheterisation.

Idiopathic proteinuria and bilirubinuria on the other hand are of much greater significance since they indicate some degree of renal, hepatic, or other dysfunction.

Of the 125 dogs examined in the survey, 15 cases showed idiopathic proteinuria (Table I). Of these only 5 were 9 years or over. A further 15 dogs of the same age group (Table II) had no proteinuria, however. This finding is contrary to the belief that proteinuria is an expected finding in older dogs.

These results emphasise that undue reliance on the presence of these compounds in urine when not supported by full clinical examination may lead to misdiagnoses. Therefore urine testing should be used to aid or confirm a clinical diagnosis. It may also give some indication of the state of renal and hepatic function. This is of particular significance where a clinician wishes to use such drugs as sulphonamides, ether, chloroform, butazolidin, mercurials, and some anthelmintics which are contra-indicated in cases of hepatic or renal insufficiency, or in cases where surgery is contemplated.

(*Concluded at foot of col.* 1 *overleaf*)

Coenuriasis as a Cause of Hydrocephalus in the Ox

BY

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AND

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SUMMARY.—A case of Coenurus cerebralis *infestation is described in a bullock, which resulted in the development of hydrocephalus.*

History

THE bullock, a Lincoln Red, which had been seen at about one year of age, was found to be poorly developed and to hold its head to one side. There was an apparent improvement in condition until shortly before death, when advice was again sought. When the animal was tapped on the head it fell to the ground as if pole-axed. Later it was found recumbent and soon died. The owner was convinced that this was a case of "Sturdy," as he maintained that several of his ewes had been affected with this condition within recent months. The animal had been born on the farm and 8 months had elapsed between the first examination and the time of death.

Necropsy

No abnormalities were found in the carcase and the complete head was despatched for a pathological report. On removing the cranium extensive subdural haemorrhage was found over the left cerebral hemisphere extending under the base of the brain. There was no apparent excess of cerebro-spinal fluid.

The brain was removed and fixed in formol-saline for several weeks. On sectioning the cerebral hemispheres it was found that there was considerable dilatation of the lateral ventricles, together with a large haematoma in the left lateral ventricle. The brain was then sectioned at varying levels, to determine whether there was any obstruction of the ventricular circulation of the cerebro-spinal fluid, which could have caused damming back in the lateral ventricles. At the level of the anterior corpora quadragemina a yellow-white, circular, cyst-like lesion was found, some 5 mm. in diameter, completely occupying the cerebral aqueduct. It was considered that this was probably parasitic in origin and histological preparations were made. An attempt was made to determine the full extent of the cyst, and on tracing it forward it was found to occupy the third ventricle and to pass through the interventricular foramen into the right lateral ventricle, where some 400 scolices were counted. In a posterior direction the cyst extended about 2 cm. along the cerebral aqueduct.

Histology

In microscopical examination the cyst could be clearly seen occluding the lumen of the dilated cerebral aqueduct. There was some disruption of the ependyma with gliosis and a mass of eosinophilic material protruded into the coenurus from the ependymal reaction tissue on one side. The ependyma was surrounded by a zone of infiltration with lymphocytes, eosinophils, and some plasma cells. The preparation showed about a dozen heads in section at this level, some of which showed the suckers and immature hooks of the rostella which had arisen from the lining by invagination. There appeared to be great variation in the size and development of different scolices, suggesting that the cyst was immature.

Discussion

C. cerebralis is a fairly quickly growing parasite when compared with a hyatid cyst. Lapage (1956) states that the coenurus is fully developed in 7 to 8 months. This particular coenurus appeared to be immature, but the restricted site for its growth resulting in the accumulation of cerebro-spinal fluid and final terminal haemorrhage, would appear to have prevented its full development. The early migration of the oncospheres, in from 1 to 3 weeks after infection, is known to be a cause of encephalitis and possibly of death also. It is thought that the early clinical signs shown by this animal may have been caused by this larval migration. Henneberg (1912) suggests that in the case of human cerebral cysticercosis the fourth ventricle may be a predilection site, as the embryo gains access to the cerebro-spinal fluid by way of the choroid plexus and is then carried down to the foramen of the fourth ventricle where it is held up. In this case the coenurus developed in the ventricles instead of reaching its more usual site on the surface of the brain.

No reference has been found to parasites as a cause of hydrocephalus in animals. Russell (1949) in her monograph, describes 2 cases of cerebral cysticercosis in man associated with dilatation of the ventricles. In one case there was little doubt that the closure of the fourth ventricle resulted from the inflammation

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Examination of Urine—*Concluded.*

The proprietary tablet tests have been found to correspond closely with the established tests and have the advantage of being easier to use in the field and giving less scope for variations due to practical errors.

Acknowledgments.—We wish to thank Mr. G. C. Knight, who suggested the project, Mr. R. C. Frost and Miss B. M. Q. Weaver, who collected some of the specimens for us, and Messrs. Ames & Co. Ltd., for the proprietary tablets.

caused by products of the degenerating cysticercus in the brain. Becker and Jacobson (1951) described 3 cases of human infestation with *Coenurus cerebralis*, and stated that the final syndrome in each case which brought patients to the surgery resulted from the obstruction to the cerebro-spinal fluid pathways, with resulting increased intracranial pressure. In all these cases ventriculography had shown dilatation of the lateral ventricles, and at operation cysts were removed which were blocking the foramina of Lushka and Magendie.

It is surprising that this parasite is able to maintain itself under present-day conditions. Mönnig (1947) suggests that it is probable that the infection is kept going in some countries between antelopes and wild carnivora, since an occasional epizootic is seen where no dogs are present. Similarly, Fankhauser (1955) describes a case in Switzerland recently, and considers that the parasite maintains itself in the Alps in the wild chamoix and foxes, as it is almost extinct in domestic animals. Many foxes are found in this area of Leicestershire and they may well be the final host of *Taenia multiceps*.

Infestation of the human central nervous system has been reported in four cases recently (Becker & Jacobson, 1951; Clapham, 1941), so it appears that this parasite is a possible source of danger to man as the intermediate host.

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Clinical Note

CHEYLETIELLA PARASITIVORAX INFESTATION OF THE DOG

M. Humphreys

Worthing

This mite was first brought to our attention about a year ago as the result of a complaint by a client who had noticed excessive scurf in her kennels of Bruxellois Griffons. Examination of the dogs disclosed the presence of mites, just visible to the naked eye, but we were unable to identify them at microscopical examination of mounted specimens. Some specimens were sent to Dr. J. N. Oldham, at the Royal Veterinary College, who identified the mite as *Cheyletiella parasitivorax*.

This mite has been recorded as occurring on rabbits, squirrels, birds and cats in different parts of the world. It has not previously been recorded from dogs in England, so far as we are aware, and several other ases of this mite infestation on various kinds of dogs, but not on cats, have been seen in this practice during the past year. Although pruritus was not seen in the first case, later cases have shown persistent pruritus as well as excessive scurf.

The mite was usually found on the skin and sometimes on the hair shaft and, in dead animals, could be easily seen on the tip or mid-part of the hair shaft since, on measurement, it was found to be slightly larger than Octodectes. No eggs were recovered from the host although they were seen within the mite (Plate III). The life cycle of the mite may be summarised as follows : incubation period 4 days, larval stage 7.5 days, first nymphal stage 4.5 days, second nymphal stage 5 days and adult-stage 13 days. Some authors consider that *Cheyletiella parasitivorax* is predacious feeding on other mites such as Notoedres in lesions on cats and that it is found at the periphery of such lesions. In our cases, however, despite a careful search no other mites such as Otodectes, Sarcoptes or Demodex were found. Other authors believe that it is pilicolous and lives a free existence amongst the hairs of its host. (Plates overleaf).

The morphology of the mite is characteristic (Plate I), a pear-shaped effect being produced by the bulging of the body between legs II and III. The pedipalps on the anterior region are greatly enlarged, giving the appearance of an additional pair of legs. Each palp ends in a prehensile claw used to grasp the feathers or hairs of the host and possibly also for feeding. Six long hairs may be seen on the body, 1 on each side of the terminal anus and 2 on each side of the body between legs II and III (Plate I). The mite can readily be distinguished from other species of the genus Cheyletiella by the presence of combs only and the absence of claws at the end of the tarsi.

Besides occurring on the hosts noted above, this mite has also been recorded as causing a dermatitis in humans and, in this practice, instances were brought to our notice in which two ladies, having nursed infested dogs, were affected. After the mites had been destroyed on the dogs, the condition in the humans cleared up in a few days. In the cases seen, there was a history of the dogs having been exercised in rabbit-infested areas and where the rabbits have been destroyed by myxomatosis.

In this practice, treatment of dogs has consisted in sulphur baths, 2 or 3 baths usually being effective in clearing up the condition. No other parasiticidal treatment has been found necessary. No doubt other acaricidal dressings would be found equally effective.

I wish to thank Mr. F. G. Startup, B.SC., M.R.C.V.S., and Mrs. C. M. Startup, M.R.C.V.S., for having brought the mite to my notice and for their co-operation, help and advice which have made the preparation of this paper possible. Thanks are also due to Dr. J. N. Oldham, who kindly identified the mite, to Mr. W. Gregor, M.R.C.V.S., and the clinical staff of the Royal (Dick) School of Veterinary Studies, Edinburgh, who mounted specimens, and to Mr. Hood, F.I.B.P., F.I.S.T., also of the Royal (Dick) School of Veterinary Studies, for the excellent microphotographs.

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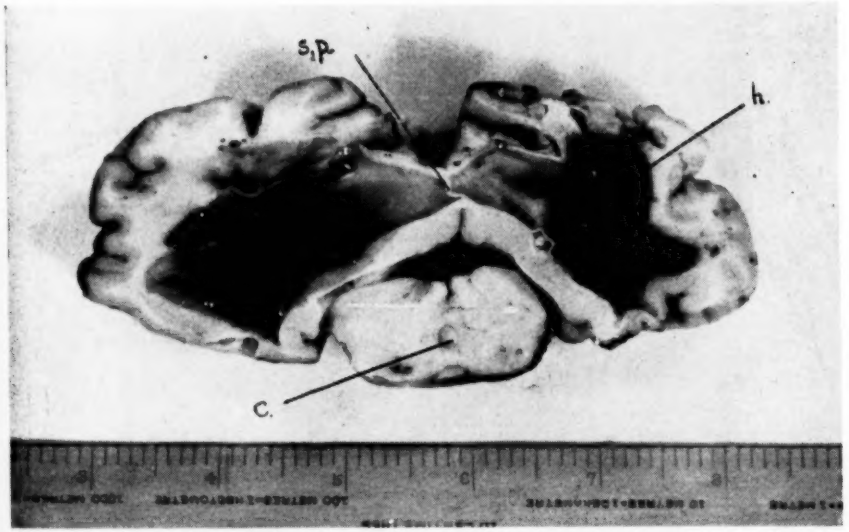

FIG. 1.—Section at level of the anterior corpora quadragemina viewed from the front, showing the site of the coenurus (c.) and the haematoma (h.). s.p.—septum pellucidum.

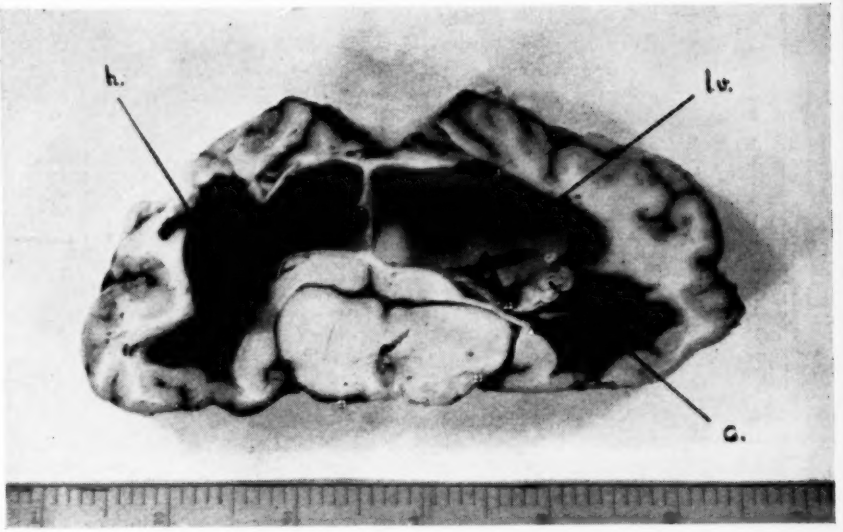

FIG. 2.—Section at same level viewed from behind, showing the portion of coenurus (c.) free in the dilated lateral ventricle (l.v.).

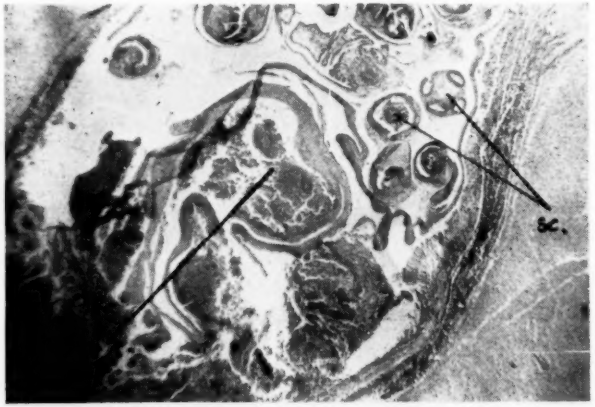

FIG. 3.—× 20 approx. Showing numerous scolices (sc.) and the eosinophilic mass (e.). H. & E.

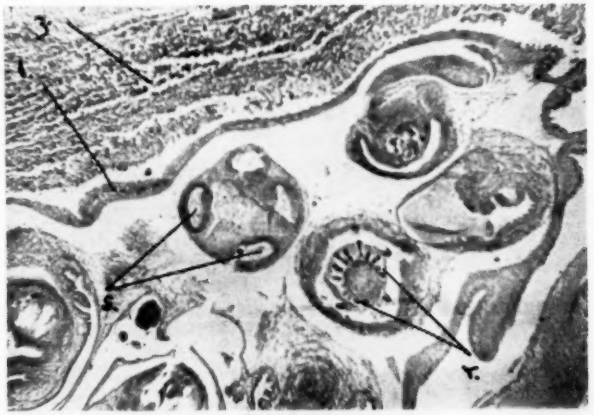

FIG. 4.—× 50 approx. Showing the lining of the coenurus (l.), suckers (s.), rostellar hooks (r.), and the zone of ependymal reaction (z.). H. & E.

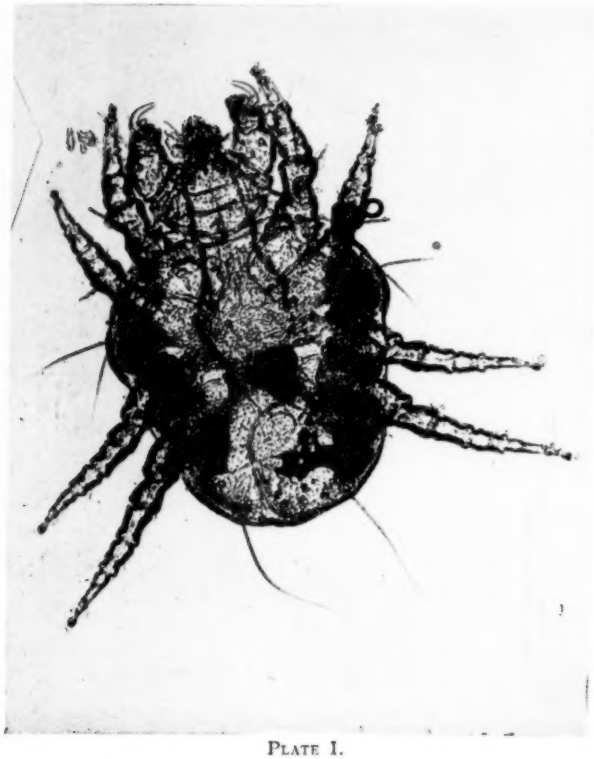

PLATE I.

PLATE III.

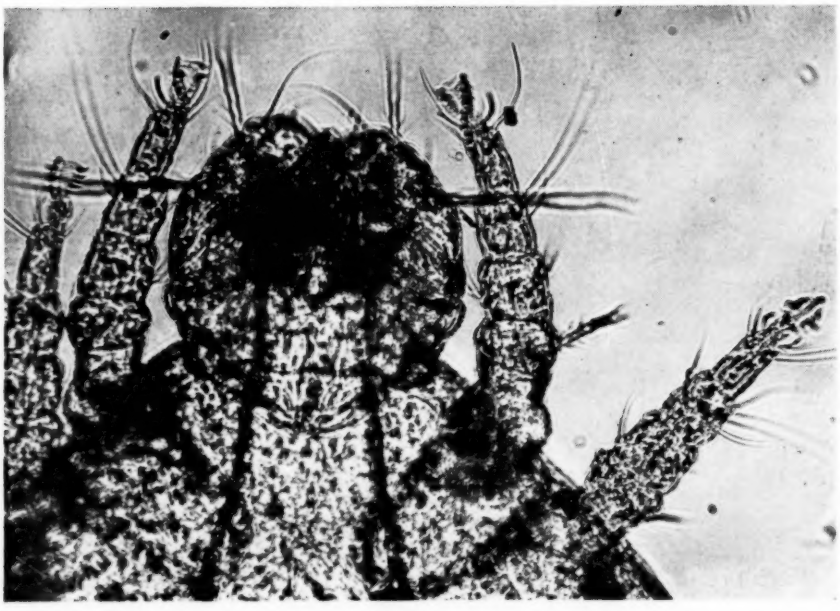

PLATE II.

Some Notes on the Epidemiology of Fowl Typhoid

BY

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DURING the last decade fowl typhoid (*Salmonella gallinarum*) has been the cause of considerable financial loss to poultry owners, particularly in Yorkshire, parts of Wales and the adjacent English counties. Birds of all ages and both sexes are susceptible to infection, but the most serious losses occur in laying hens and pullets coming into lay. The mortality rate may vary from the loss of a few birds up to 80 per cent. of the flock. Although outbreaks can occur at any season of the year the peak incidence is in summer and autumn. Other species that may be affected include turkeys, guinea fowls and game birds.

Predisposing Causes

The severity of an outbreak depends not only on the virulence of the organism, but on a number of predisposing causes. Heavy breeds are more susceptible than light breeds (Williams Smith, 1956a). More outbreaks occur in birds kept on free range where there is more chance of cross infection than in battery housed birds (Sellers & Harbourne, 1953). Deep litter houses may either shield birds from outside infection or after the disease has been introduced provide the over-crowded conditions which aid its spread. Birds which are starved or those maintained on a high level of fish meal or decorticated groundnut meal are more likely to die from fowl typhoid than those fed on ground wheat and 2½ per cent. fish meal (Williams Smith & Chubb, 1957). Infection also spreads more rapidly from infected to healthy chickens when they are fed on mash rather than whole wheat (Williams Smith, 1954).

Description of an Outbreak

The presence of a few dead birds may be the first sign of an impending outbreak. Later an increasing number of birds die after an illness lasting from 3 to 10 days. They stand or lie in attitudes of complete dejection with half closed eyes and ruffled feathers and an occasional bird may be seen with its head tucked under a wing. The combs and wattles are often cyanosed but may appear anaemic and a characteristic feature is the presence of sulphur yellow droppings which stain the vent feathers. The birds refuse food but drink copiously.

After 2 to 3 weeks when the outbreak has passed its peak sporadic losses occur either from the chronic form of the disease in which the birds lose weight and appear anaemic or from a flare-up of the acute type.

Williams Smith (1955a), found that after infecting 300 9-week-old cockerels by mouth with *S. gallinarum* 45 per cent. died in the acute stage of the disease and 15.7 per cent. in the chronic. Deaths usually commenced 7 days after infection, reaching a peak on the 8th and 14th day; very few deaths took place after the 20th day.

Appearance of Agglutinins

Birds suffering from the acute form of the disease often die before the formation of agglutinins; indeed their production may be a sign of commencing recovery (Wilson, 1946). Williams Smith (1955a) found that after he had administered small amounts of *S. gallinarum* by mouth to 144 9-week-old chickens, 24 were positive to the agglutination test 10 days later and 44 were positive 20 days later. No more became positive after this time. When chickens 3 days old were injected the survivors did not produce agglutinins until they were at least 4 weeks old.

Transmission through the Egg

Birds which are positive either to the tube agglutination test or to the rapid whole blood plate test may be carriers of *S. gallinarum*. Repeated blood testing at intervals of 14 days and the removal of reactors is a most useful method of controlling the disease especially in breeding flocks. Thus, both Hall *et al.* (1949a) and Jordan (1956a) showed that up to 50 per cent. of reactor birds may lay infected eggs for periods which may be at least as long as 24 months after an outbreak. The proportion of positive eggs laid by reactors varies. Wilson (1956b) found 108 positive eggs out of 1,843 eggs laid by 21 carrier fowls. Individual production of infected eggs varied from 5 to almost 40 per cent. with an average of 18 per cent. Such eggs may not only transmit the infection to baby chicks, but as the result of egg eating spread the disease to susceptible older birds (Hall *et al.*, 1949a).

Faecal Excretion and the Longevity of *S. gallinarum*

The disease may also be spread by the contamination of food and water with infected droppings (Gordeuk *et al.*, 1949). Williams Smith (1955a) isolated *S. gallinarum* from the faeces of chickens 83 days after experimental infection and both Jordan (1956b) and Harbourne (1956) were able to recover the organism from cloacal swabs of birds which were survivors from outbreaks which had occurred 2 months previously. It would seem, however, that although large numbers of the organism are excreted in the faeces of birds dying from the acute form of the disease, in chronic faecal excretors the organism appears intermittently and in small numbers (Jordan, 1956b; Williams Smith, 1955a). Thus Wilson (1946) although successful in reproducing the disease in susceptible birds by housing them with carriers, made the important observation that the spread of fowl typhoid by contact requires a high concentration of infection. Harbourne (1955b) was able to

cause the death of only 2 out of 15 susceptible cock chickens 11 days after they had been mixed with 9 similar birds, which had been infected by mouth 45 days previously. One of the infected chickens was a known faecal excretor. Hall *et al.* (1949a) also showed that when birds were placed in infected huts only 8.1 per cent. died from fowl typhoid. In contrast 40.5 per cent. of another group of susceptible birds died when they were housed in contaminated pens containing acutely sick birds. Williams Smith (1955b) when studying the longevity of *S. gallinarum* in the faeces of infected chickens found that the degree of infection was never heavy, but the organism survived for at least 37 days and lived longer in dry than in moist faeces. Orr and Moore (1953) also showed that *S. gallinarum* would survive for 228 days on previously sterilised portions of sacking kept in the dark at room temperature and for 93 days in frozen distilled water and 88 days when the water was kept at room temperature and Wilson (1958) reported that the organism persisted in chaff and deep litter for 60 to 70 days and for much longer periods in dry sterile chaff kept under laboratory conditions.

Carcases as a Reservoir of Infection

The unburied carcases of birds which have died from fowl typhoid can be a dangerous source of infection. They may contaminate the ground and water supplies and are also exposed to the depredations of vermin and wild birds. Jordan (1954) isolated *S. gallinarum* from the bone marrow of a carcase 32 days after death and from the liver of chickens up to 11 days after they had died from fowl typhoid and Orr and Moore (1953) recovered the organism from infected liver 14 days after storage at 7° C. Wilson (1958) also stated that the organism has been isolated from carcases of birds dead from acute fowl typhoid after being in static water for up to 148 days and from carcases buried in the ground for 168 days and in refrigerated carcases for up to 486 days. Luke *et al.* (1952) were successful in isolating *S. gallinarum* from the intestines of a brown rat and Harbourne (1955a) recovered the organism from 7 rooks and 1 pigeon out of a total of 51 wild birds shot in areas of Yorkshire where fowl typhoid was enzootic, but not from 37 rooks obtained from other parts of the county where the incidence of the disease was insignificant.

Likely Methods of Spread in the Field

Under natural conditions few outbreaks originate from the purchase of infected day-old chicks, since the majority of farmers obtain their replacement stock from blood tested sources. Also the indications are that the spread of the disease from farm to farm seldom takes place as the result of contaminated poultry appliances, vehicles, boots and clothing (Luke *et al.*, 1952; Sellers & Harbourne, 1953). This might help to explain the fact that the distribution of the disease tends to be restricted to certain localities where the most likely sources of infection would be the sick and carrier birds and the carcases of dead birds. Although the risk of infection being carried on clothing and on the hands must not be overlooked (Wilson, 1958), especially as a means of spreading the disease from pen to pen on the same farm.

On some farms the disease may occur in successive years. Thus out of 39 farms in Yorkshire which experienced losses from fowl typhoid in 1952, 17 had fresh outbreaks in 1953.

During a series of field trials using live vaccines to control fowl typhoid Harbourne (1957a) obtained details about the methods of husbandry and the possible contacts between trial birds and survivors from previous outbreaks of the disease. Preventive vaccination was performed in groups of birds on 43 farms. One-third of each group was left as unvaccinated controls. At 17 of the farms fowl typhoid was diagnosed in one or more of the unvaccinated birds and at 9 of them the trial birds were in contact with survivors of a previous outbreak for at least 6 weeks and at one farm for only 2 weeks. There was no known contact with infected birds at the remaining 7 farms but at 4 of them fowl typhoid was present in other birds on the farm. The results obtained are summarised in the table below.

These results tend to confirm the impression that contact with sick or carrier birds is the most important means of spreading the disease. All the birds were kept on free range for some time during their lives, but it is interesting to note that at 3 of the 4 farms where contact with infected birds was indirect, the birds were removed to deep litter houses. The same method of management was subsequently adopted at 2 of the farms where there had been direct contact with infected birds for at least 6 weeks and at one of the farms where there were no infected birds on the premises.

Sex Susceptibility

The average ages of the first birds to die show that the birds, which were all pullets, were just coming into lay. This might suggest that the increased strain of egg production could be a precipitating factor. Nevertheless mature cockerels are just as susceptible to experimental and natural infection (Wilson, J. E., 1946; Sellers & Harbourne, 1953; Williams Smith,

Number of farms	Total number unvaccinated trial birds	Total number of deaths from fowl typhoid	Percentage death rate	Average age of first bird to die (months)	Remarks
9	396	54	13·5	5½	Contact with fowl typhoid survivors for at least 6 weeks
1	135	1	0·7	5	Contact with fowl typhoid survivors for 2 weeks
4	416	29	7	6	Infected birds on farm but no direct contact
3	190	4	2	6	No infected birds on farm

1955a) and there is always the possibility that they may release infected semen. Wilson (1946) isolated *S. gallinarum* from the testes of cockerels suffering from the acute form of the disease and Harbourne (1956) recovered the organism from the testes of a cockerel which was killed 8 weeks after infection.

Further Possible Sources and Pathogenesis

The likelihood that the outside of egg shells may be contaminated with infected faeces cannot be overlooked (Wilson, 1946). Wilson (1946) also recovered *S. gallinarum* from the oviducts of acute experimental cases and this would provide an additional means of discharging the organism from infected hens. Hall *et al.* (1949a) stated that during the acute stage of the disease the organism is not only passed out in the droppings, but in the secretions from the eyes, nose and mouth, although experimental infection on the nasal or ocular mucous membranes usually fails (Buxton, 1957). Harbourne (1957b), however, observed that it was possible to produce experimental infection in 6 16-week-old pullets after instilling a whole broth culture of a recently isolated strain of *S. gallinarum* into their conjunctival sacs. Both Wilson (1946) and Williams Smith (1955a) recovered the organism from the lungs of infected birds, though the latter was able to show that after *S. gallinarum* was administered by mouth to groups of chickens, lung cultures were completely negative 48 hours after administration. He found that a bacteraemic phase usually commenced on the third day after oral infection and lasted for several days. Later the organism tended to be restricted to certain organs, more especially the heart wall and to a lesser degree the liver, spleen, pancreas, intestinal wall and intestinal contents. It was rarely recovered from the lung, femur and bile, although Harbourne (1956) had no difficulty in isolating *S. gallinarum* from the gall bladders of 6 out of 10 chronic carriers. A particularly common site for the recovery of the organism in female birds is the ovary, where it may persist in distorted ovules even after treatment with a bacteriocidal drug (Wilson, 1946, 1956b; Harbourne, 1956).

Immunity

Once birds have recovered from the acute form of the disease they appear to be solidly immune to further infection for some considerable time, but when they are retained for periods of 1 or 2 years deaths may occur from virulent fowl typhoid (Wilson, 1946 and 1956a; Williams Smith, 1955a), Hall *et al.* (1949b) also reported that of 55 birds which had reacted strongly for an average period of one year, 14 eventually died of the acute disease.

It therefore follows that the presence of agglutinins in the blood does not necessarily mean that birds are immune to an existing infection. It is now apparent from the work of Williams Smith (1956b) that this antibody is probably only one of a number of factors responsible for the production of immunity. He was able to produce a good immunity in chickens using a rough strain of *S. gallinarum* which did not produce antibodies that agglutinated smooth strains of *S. gallinarum*. There is no doubt, however, that the demonstration of agglutinins after infection with a smooth strain of *S. gallinarum* indicates either the presence of an existing infection or a previous infection. The loss of agglutinins may mean that a bird is no longer harbouring the organism. Thus a few weeks after infection some birds may show a declining titre and in certain birds after a period of months agglutinins may have disappeared. Bacteriological examination of such birds shows that the organism is no longer present. In other cases agglutinins may persist for some time after elimination of the causal organism (Wilson, 1946). In support of these findings Harbourne (1956) was unable to recover a field strain of *S. gallinarum* from birds which had given a negative reaction to the rapid whole blood plate test at the time of slaughter, although they had given positive reactions on previous occasions.

Finally, although much is known about the epidemiology of this disease, there are still questions requiring an answer. Do birds become latent carriers of infection before actively disseminating the disease? Why are certain age groups more susceptible than others and why is there a seasonal increase in the number of outbreaks? Why are there sudden and severe epidemics and what constitutes immunity?

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THE R.C.V.S. LIBRARY

We are asked to make it known that, owing to the preparations for the exhibition of photographs taken by the Cambridge Tibesti exhibition, the library of the Royal College will be closed so far as its normal work is concerned on Monday, Tuesday, and Wednesday, June 9th, 10th, and 11th. The photographic exhibition will be open on R.C.V.S. Day, June 11th.

XUM

Current Literature

BOOK REVIEWS

Tuberculosis in Animals and Man. JOHN FRANCIS, D.SC., M.R.C.V.S. Cassell & Co., Ltd. London, 1958. £5 5s.

Professor Francis's previous volume, "Bovine Tuberculosis," enjoyed a deserved popularity with the veterinary and medical professions. This new book is not merely a revised version of the former one, but is a new compilation covering the disease in many species.

Pride of place is, of course, given to tuberculosis in cattle and an extensive account of incidence, pathogenesis, immunisation, and control is given. The first part of this section will become of rather historical interest as it details the status of the disease in the developed countries at present and this is, of course, changing rapidly. However, the exposition, presentation of statistics, and illustrations are excellent while the bibliography is very extensive. No veterinarian should be without the knowledge embodied in this account.

The second part of the book deals with the disease in other species and as full details as are at present known are given. It is unfortunate that more clinical data on the disease in dogs and cats are not given, as these have assumed greater importance in recent years as vectors of the human disease. This is no criticism of the book as the information has not yet been published in any detail. The illustrations in this section also are generous and of good quality and the references and summaries will be of immense benefit to future workers and writers.

The third section is a very useful and stimulating comparison of the pathology and epidemiology of tuberculosis in animals and man.

The publishers have done this excellent book full justice by providing handsome setting, typography, and illustration; it will certainly find for itself a permanent place in veterinary literature.

Dairy Husbandry. By R. Kenney. Nelson. 12s. 6d.

So much publicity is given to milk and milk production to-day, that anything new in milking technique or dairy herd management is lost in the maw of the eager reader almost before it has had time to mature and take its place on the back-cloth of progress. One would hardly therefore expect a new book on dairy husbandry to have any strong appeal, but Kenney's book has. It is compact, forthright, excellently illustrated, and politely reminds one that after all there is a lot more in dairy farming than meets the eye. While one is made to realise what an "efficient business" milk production should be, with buildings and production methods organised on factory lines, one is constantly reminded that all this is nothing without good stockmanship.

There are some interesting notes on the popular breeds of to-day, and herd improvement, breeding, feeding and housing are all presented in a readily digestible form. This is a book probably of particular value to the veterinary student and young graduate.

Manual of Microbiological Methods. Society of American Bacteriologists. McGraw-Hill Book Co. Inc., London, 1957. Pp. x + 315. 29 tables. 4 figs. 43s.

This book takes the place of a loose-leaf publication issued between 1923 and 1956 entitled "Manual of Methods for Pure Culture Study of Bacteria"; the change of form is welcome. Five of the 13 chapters are new, those on Maintenance and Preservation of Cultures, Physiological and Biochemical Techniques, Serological Methods, The Detection of Bacterial Pathogenicity, and Virological Methods. References to the relevant literature at the end of each chapter are an attractive feature.

Covering so wide a field in some 300 pages the book is easy to criticise, giving impressions of a quite omnibus nature in some instances, and of inadequacy in others. This is, perhaps, understandable, though the absence of techniques for the enumeration of bacteria in their natural habitats from a "Manual of Methods" is hardly so. However, the scope of the book is defined in some detail in the first chapter, and such omissions are, in general, deliberate.

Less readily acceptable is the mixture of quite elementary and highly advanced material; one wonders who will profit the more, student or expert. Again, however, it may be argued that a book of methods must of necessity include both and, therefore, that all levels of reader will find it of value. Of this there is, in fact, no question; he who has it on his shelves (or most probably more readily to hand) will have cause in time to approve the quality and durability of paper and binding.

There are many small points on which one could take issue with the authors, though some may be matters of personal opinion or preference; however, sanction of the routine use of xylene when harvesting rabbit antisera is strongly to be deprecated, and the use of a razor blade when withdrawing small quantities of blood from the marginal ear vein is quite unnecessary, needle puncture being adequate. Surprising omissions are MacConkey's medium, and Lancefield's and Fuller's methods of extracting bacterial cells for precipitin tests, which are not even mentioned; description of staining techniques for spirochaetes in sections would be valuable. It is also surprising that no recommendation is made on the preservation of lactobacilli by freeze-drying, although present-day experience, at least in this country, has shown freeze-drying to be admirable for the maintenance of this heterogeneous and fastidious group of organisms.

A few points of criticism are outweighed by many of congratulation; to take one small example, work as recent as that of Ellner (1956) on the promotion of sporulation in clostridia is included and—more important—its value recognised.

As a whole this is an excellent, comprehensive, and up-to-date book, with outstanding chapters on *p*H and Eh determination, culture maintenance, characterisation, serology, and pathogenicity. It is

an admirable combination of textbook, bench book, and reference book, and in the latter capacity will be of value also to those of disciplines other than microbiology.

ABSTRACTS

Distribution of Penicillin in Mastitic Udders Following Intramammary Injection—An Autoradiographic Study. ULLBERG, S., HANSSON, E., & FUNKE, H. (1958). *Amer. J. Vet. Res.* **19.** 70, 84.

The distribution of labelled penicillin in the normal and diseased udder was studied following intramammary injection either of an aqueous solution or a suspension in oil. Using a technique of autoradiography it was shown that the distribution of penicillin within the udder in the early stages of acute mastitis was usually good. When the antibiotic was introduced after the appearance of the milk had become abnormal, distribution was unsatisfactory and penicillin could be demonstrated only in the larger milk ducts and in a few lobules. In the more chronic cases of mastitis which showed little or no macroscopic abnormality of the milk, distribution was generally good throughout the whole of the udder, although some areas of varying sizes showed only slight or undetectable amounts of penicillin. Where widespread induration was present distribution was very poor, and in one case of chronic mastitis due to *M. pyogenes* penicillin was detected only in the teat cistern. As tissue debris may thus block the dissemination of therapeutic agents through the ducts, the authors suggest that the simultaneous use of proteolytic enzymes should be further investigated. The use of parenterally administered antibiotics is mentioned as a means of obtaining therapeutic levels of antibiotic throughout the udder.

J. H. T.

Feline Infectious Anaemia. FLINT, J. C., *et al.* (1958). *Amer. J. Vet. Res.* **19.** 164-8.

The authors report on their studies of a newly recognised acute or chronic disease of domestic cats caused by *Haemobartonella felis*. They have investigated the disease in two phases, clinical and experimental, of which this report is the first.

Thirty cases were seen in 3 years at the Flint Veterinary Hospital, Salt Lake City, 28 of which were males and 2 females. Twenty-two of the cases occurred in cats between the ages of 1 and 3 years—*i.e.* on reaching sexual maturity. Twenty per cent. of these cats came to the hospital originally for the treatment of abscesses. This may have some direct bearing on the mode of transmission or it may be coincidental with fighting as a result of sexual maturity.

The typical clinical picture presented is that of weakness, depression, anorexia, and marked macrocytic haemophylic anaemia. The initial haemoglobin is low—all were under 7 grammes per 100 ml. The erythrocyte counts were correspondingly low. Blood smears stained by Giemsa or Wright's stains reveal small rod- or cocci-like bodies present on the erythrocytes. Small amounts of blood from infected cats given to normal susceptible cats by either the oral, intraperitoneal, or intravenous routes produce a clinical condition identical to that present in the donor cat. It is believed that many adult cats are carriers of the disease as a result of earlier infection, the infection lying dormant until some debilitating condition lowers the host vitality.

The most successful line of treatment adopted so far, appears to be transfusion with whole blood, aided by arsenical preparations and broad-spectrum antibiotics. There is, however, a tendency for fatal relapses after apparent clinical recovery.

This report leaves little doubt that it must be assumed that cats in many parts of the United States suffer from an infectious anaemia which often proves fatal, and it may well be that some of the moribund cats brought to practitioners in this country may be suffering from a similar condition.

J. S. J. L.

Feedlot Tests of the Efficacy of Dow ET-57 (Trolene) for Control of Cattle Grubs. RAUN, E. S., & HERRICK, J. B. (1957). *J.A.V.M.A.* **131.** 421-3.

The control of ox warble fly maggots for the past 35 years has depended mainly on applications of rotenone-bearing sprays or dusts whilst the maggots are in the subcutis of the host's back. The average kill has been about 85 per cent. Attempts to kill or repel the adult flies have been only partially successful. With complete eradication apparently impossible using present control procedures, some research on the possible use of systemic insecticides has been reported. This paper deals with the use of Dow ET-57 (Trolene), an organic phosphate (0, 0-dimethyl-0-2, 4, 5-trichlorophenyl phosphorothioate), which was administered in gelatin capsules at a dosage rate of 110 mg. per kg. bodyweight. The 77 Hereford steers, averaging 883 lb., which were treated were observed for 106 days and then slaughtered. Counts of maggots in the live animal and in the carcase and hide of the dead animals gave a total of 49. In the 77 untreated steers, averaging 903 lb., similar counts gave a total of 911 maggots. Treated and untreated animals gained respectively 2.48 and 2.33 lb. per day and there was essentially no difference in carcase grades at slaughter. Initially, the treated animals, all of which were on full feed, showed a rather severe intoxication from the treatment, going off feed for 2 or 3 days and not returning to the consumption level of the untreated steers for nearly 2 weeks. The authors assert that the results of the tests indicate a 94.7 per cent. reduction of the maggots before they reach the back. The total saving in feed alone was about £11 for the 77 treated steers.

J. N. O.

R.C.V.S. DAY

We are asked to advise readers that, as there are only a limited number of tickets for the functions on this Day, early application is advisable. The Day is June 11th, and applications should be made to the Registrar.

News and Comment

XVIth INTERNATIONAL VETERINARY CONGRESS, MADRID

May 21st to 27th, 1959

The following information has been received from the secretary of the organising committee in Madrid:—

Exhibitions. Three are proposed:—

(1) Veterinary medicines and instruments, and feedstuffs for livestock.

(2) Bibliography (this will be most contemporary and historical).

(3) Photography.

Will all firms and individuals who may be interested in exhibiting under any of these three heads, please communicate directly with Pedro Carda, General Secretary, Villanueva, 11, Madrid, sending a copy to the Registrar of the R.C.V.S., who is secretary to the British National Committee.

Excursions. Thomas Cook & Son, Ltd., are officially in charge of the trips, accommodation, and tourist excursions for the Congress. They propose to organise three excursions after the Congress, one in the south of Spain (Andalucia), one in the north (Salamanca, Galicia—*via* Portugal—and to the Cantabrique Coast), and one to the north of Valencia, Cataluna, and eventually, Balearic Isles.

During the Congress members will be able to visit the centre of Spain (Madrid, Escorial, Avila, Segovia, etc.) in short excursions of one day (including Sunday, May 24th). Another possibility for this day is to visit the Feria National del Campo in Madrid.

Papers. An announcement will shortly be made on behalf of the British National Committee regarding papers for the Congress.

UNIVERSITY NEWS

Liverpool

Mr. H. E. Ritchie, B.V.SC., M.R.C.V.S., lecturer in Veterinary Medicine, has been appointed to a Kellogg Foundation Fellowship and will spend the 1958-9 Session at Cornell University.

THE ASSOCIATION OF VETERINARY TEACHERS AND RESEARCH WORKERS

A meeting of the Scottish Regional Group was held in the University Veterinary Hospital in Glasgow on May 10th. Of 120 people who attended approximately 65 were members of the Group in Scotland, 30 came from the Scottish medical schools, and 25 were friends from south of the border.

The meeting took the form of a symposium on Immunology, the papers being presented by distinguished research workers from different parts of the country. The following is a list of those who contributed papers:—

Professor J. R. Marrack, Cambridge, "Modern Concepts of Antibody Production"; Dr. Wm. Mulligan, Glasgow, "Immune Tolerance"; Dr. M. A. Soltys, Cambridge, "Immunity in Trypanosomiasis"; Professor C. L. Oakley, Leeds, "The Local Production of Antibody"; Dr. A. McDiarmid, Compton, "Evaluation of the Strain 19 Vaccine in Cattle"; Dr. A. C. Wardlaw, London, "Properdin"; Dr. D. G. Howell, London, "The Use of Tissue Cultures in Vaccine Production"; Dr. W. F. H. Jarrett, Glasgow, "Helminth Immunity."

R.C.V.S. OBITUARY

Supplementary Veterinary Register

COVENEY, Frank, Frandol, Headcorn, Kent. Died April 19th, 1958.

SANDERS, William Ernest, 59, Victoria Road, Exmouth, Devon. Died December 20th, 1957.

PERSONAL

Professor McCunn and **Professor Amoroso** were both elected to Honorary Fellowship of the Central Veterinary Society at the Annual General Meeting.

Births

BLACKMORE.—On May 6th, 1958, to June, wife of David K. Blackmore, B.SC., M.R.C.VS., of Stable Flat, Braunston Road, Oakham, a daughter, Corinne.

GRIFFITHS.—On May 14th, 1958, to Fanod, wife of A. V. Griffiths, M.R.C.V.S., Dol-llan, Llandyssul, Cards., a daughter, sister for Eiola.

REID.—On May 15th, 1958, to Beryl, wife of John H. Reid, M.R.C.V.S., of 31, Victoria Road, Shifnal, Salop, a son, Graham, brother for Susan.

COMING EVENTS

May

28th (Wed.). Annual General Meeting of the Southern Counties Veterinary Society at the Red Lion Hotel, Salisbury, 7 p.m.

Annual General Meeting of the South-east Midlands Veterinary Medical Association at Franklin's Gardens Hotel, Northampton, 8 p.m.

29th (Thurs.). Meeting of the Ayrshire Veterinary Association in the Station Hotel, Ayr, 2.30 p.m.

30th (Fri.). Ordinary General Meeting of the Royal Counties Veterinary Association in the Village Hall, Compton, 2.30 p.m.

31st (Sat.). Meeting of the B.S.A.V.A. Southern Region at the Royal Hotel, Winchester, 7.30 p.m.

June

4th (Wed.). 16th Annual General Meeting of the Society of Women Veterinary Surgeons at the Meeting Hall of the Zoological Society of London, Regent's Park, N.W.1, 2.30 p.m.

General Meeting of the South Wales Division at the Cambrian Hotel, Saundersfoot, 2.30 p.m.

6th (Fri.). Annual Dinner and Reunion of the Royal Veterinary College Association at the Royal Veterinary College, Camden Town, 6.30 for 7 p.m.

11th (Wed.). 115th Annual General Meeting of the Royal College of Veterinary Surgeons at 10, Red Lion Square, London, W.C.1, 3.45 p.m.

Annual General Meeting of the Victoria Veterinary Benevolent Fund at 10, Red Lion Square, W.C.1, 10.15 a.m.

Meeting of the North Wales Division at Bryn Adda, Dolgellau, 2 p.m.

12th (Thurs.). Annual Meeting of the R.A.V.C. Golfing Society at the North Hants Golf Club, Fleet, 10 a.m.

13th (Fri.). Annual Dinner of the Royal Army Veterinary Corps Officers' Club at Grosvenor House, Park Lane, London, W.1.

20th (Fri.). Meeting of the Society for the Study of Animal Breeding at Lyndhurst, Hants.

Annual General Meeting of the Lincolnshire and District Division at the Eastgate Court Hotel, Lincoln, 2.15 p.m.

25th (Wed.). Summer Meeting of the Herts and Beds Veterinary Society.

September

21st to 26th (Official Opening, Monday, September 22nd). 76th Annual Congress of the British Veterinary Association in Douglas, Isle of Man.

BRITISH VETERINARY ASSOCIATION QUARTERLY MEETINGS IN LONDON

Wednesday, July 9th—No. 7, Mansfield Street

10.00 a.m. Veterinary State Medicine Committee.
11.30 a.m. Parliamentary and Public Relations Committee.
2.00 p.m. Finance Sub-committee.
3.45 p.m. Home Appointments Committee.

Thursday, July 10th—No. 7, Mansfield Street

9.30 a.m. Small-Animals Committee.
11.30 a.m. Farm Livestock Committee.
2.15 p.m. General Purposes and Finance Committee.

Friday, July 11th—Connaught Rooms, Gt. Queen Street, W.C.2

10.15 a.m. Council.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Angus. Balruddery Farm, Liff and Venvie (May 14).
Ayrs. Dalvennan Farm, Patna (May 10).
Northants. West Meadow, Irthlingborough, Wellingborough (May 12).

Fowl Pest

Cambs. Shortacre, Station Road, Manea, March; The Acacias, Ely Road, Little Thetford, Ely; Halfway House, Little Thetford, Ely; Wisbech Road, Manea, March (May 15).
Herts. The Old Bulls Head Hotel, Baldock Street, Ware (May 9); 3, Crib Street, Ware; 1, Crib Street, Ware; Alpha Cottage, Francis Road, Ware (May 10).
Sussex. 27, Crescent Drive, N. Woodingdean, Brighton (May 10); Olvette, Lower Station Road, Henfield; Nightingale Poultry Farm, Small Dole, Henfield (May 13).

Swine Fever

Beds. Hillcrest, Barton Road, Gravenhurst (May 15).
Bucks. Lossie Cottage, Langley Park Road, Iver (May 12); Chilborough Hill Farm, Stone, Aylesbury (May 15).
Ches. Frith Hall, Wrenbury, Nantwich (May 13).
Essex. Hillview, Stamford Road, Orsett (May 9).
Glouces. The Cedars, London Road, Warmley, Kingwood, Bristol (May 12); Bedminster Down Piggeries, Bedminster, Bristol (May 15).
Lancs. Piggeries, Holly Farm, New Lane, Banks, Southport; South Lane Piggeries, Bold, Widnes; Harrison House Farm, Leigh Road, Hindley Green, Wigan (May 12).
Norfolk. Hall Farm, Carbrooke (May 9); Common Farm, Hopton, Diss (May 12); 15, Buxton Road, North Walsham (May 14).
Salop. 6, Chapel Lane, Dudleston Heath, Ellesmere; Llynclys Farm, Llynclys, Oswestry (May 13).
Somerset. Piggeries, Huish Gardens, Yeovil (May 14).
Staffs. Bingley Hole Cottages, Sewage Works, Hartshorne, Burton-on-Trent; 62, Young Street, West Bromwich (May 12).
Suffolk. Warren Farm, Badwell Ash, Bury St. Edmunds (May 15); Blackthorpe Farm, Rougham, Bury St. Edmunds (May 14); Charmans Farm, Risby, Bury St. Edmunds (May 15).
Surrey. Barr Hill Farm, Burrow Hill, Chobham, Woking (May 14).
Warwicks. Holmleigh Farm, Cotesbach, Rugby (May 13).
Wilts. Brooklet Farm, Stapleford, Salisbury (May 15).
Worcs. Weston Fields, Honeybourne (May 14).

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN
Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period		Anthrax	Atrophic Rhinitis	Foot-and-Mouth	Fowl Pest	Sheep Scab	Swine Fever
16th to 30th April, 1958		12	—	2	19	—	50
Corresponding period in	1957	12	—	—	23	—	34
	1956	42	—	—	26	—	50
	1955	38	—	—	15	—	74
1st January to 30th April, 1958		67	3	110	242	—	361
Corresponding period in	1957	176	2	15	292	—	276
	1956	934	3	8	219	—	233
	1955	349	—	6	209	—	484

TUBERCULOSIS (ATTESTED HERDS) SCHEMES

The number of Attested Herds, *i.e.*, herds officially certified as free from Tuberculosis as at 31st March, 1958, was as follows :—

England	Wales	Scotland	Total (Great Britain)
111,357	36,079	42,510	189,946

TUBERCULOSIS ORDER OF 1938

The number of bovine animals slaughtered under the Tuberculosis Order of 1938 during the period 1st January to 31st March, 1958, was 131.

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

R.A.V.C. Officers' Club Annual Dinner

Sir,—As chairman of the R.A.V.C. Officers' Club Committee may I have the opportunity of drawing the attention of those of your readers who have at any time held a commission in the Royal Army Veterinary Corps, to the date of our annual dinner, which will be held at Grosvenor House Hotel, Park Lane, London, at 7.30 p.m. on Friday, June 13th.

The dinner, at which there is traditionally no speech-making, provides a unique opportunity for past and present officers of the Corps to foregather in a pleasantly informal atmosphere, and I earnestly hope that this year we shall have the pleasure of meeting many more of those officers who served during World Wars I and II and that they will enjoy renewing old acquaintances.

I particularly wish to emphasise that attendance at the dinner is *not* confined to members of the club nor in any way restricted to regular officers. On the contrary, all who have held any form of commission in the Corps will be most cordially welcomed, and arrangements will be made for them to be seated near old friends if they will notify their wishes to the honorary secretary, R.A.V.C. Officers' Club, The War Office, Droitwich, when signifying their intention to attend.

Yours faithfully,
A. G. RALSTON.

War Office (V. & R.),
Droitwich,
Worcs.
May 20th, 1958.

IN A LIGHTER VEIN

Popular Misconceptions

Sir,—The letter in last week's issue reminded me of a similar *lapsus calami* (typewritten), of which I was a victim when a junior member of the staff of the Institute of Animal Pathology (Field Laboratories) before the war. The parcel was addressed thus:—

The Secretary of the Field Lads,
Institute of Animal Mythology,
Milton Road,
Cambridge.

No doubt many of your readers will agree that "Mythology" is a more apt title for a veterinary research and diagnostic laboratory than "Theology." But with few exceptions, the undersigned included, reference to the many veteran research workers on the staff at that particular period in the Institute's history, as "lads" was most unwarranted.

Yours faithfully,
K. C. SELLERS.

Lilystone Hall,
Stock,
Essex.
May 19th, 1958.

A Scale of Veterinary Fees

Sir,—I have been most interested to read the correspondence regarding a scale of veterinary fees. Many readers who attended the B.S.A.V.A. Congress will remember that this subject was discussed in some detail and it was unanimously agreed that a scale of suggested basic fees be drawn up. At a recent executive committee meeting of the Association this resolution was implemented by the setting up of a small sub-committee. This committee is preparing a questionnaire for circulation to all members asking for the fees charged for a comprehensive list of procedures in small-animal practice. This will be circulated as soon as possible, and as a member of the sub-committee I would like to take this opportunity of asking members to complete and return it promptly so that members may benefit from the results as quickly as possible.

In addition it was agreed that the Association should collaborate with the S.P.V.S. in the data they are collecting on the same subject. From this it is hoped that members of the profession will shortly be in a position to apply a scale of fees in their own practices to the ultimate benefit of all.

Yours faithfully,
G. N. HENDERSON,
Public Relations Officer.

"Broadlow,"
Fairway,
Merrow,
Nr. Guildford.
May 19th, 1958.

FIFTY YEARS AGO

A correspondent wrote:—

With reference to the new Bill I might state that I have suggested that if it becomes law the Council should earmark a certain percentage each year and place it to a special fund to be named the Benevolent Fund, and to be used for such purpose amongst our distressed members. I am informed on the best of authorities that the Council, under the Act, would have such power.

I remain, etc.,
W. OWEN WILLIAMS.

Liverpool University.

Mr. Williams's hope of a Benevolent Fund has long been realised, and its valuable work is known and appreciated throughout the profession. Incidentally, support would be most welcome from members who do not, at present, contribute to it.

SUPPLEMENT TO "THE VETERINARY RECORD"

A Supplement is published with this week's issue of THE RECORD, and all members of the B.V.A. should receive a copy together with the journal.